

SEASONAL AND SEXUAL VARIATION IN THE DIET OF THE COMMON BUZZARD IN NORTHEASTERN SPAIN

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ABSTRACT.—We examined the diet of Common Buzzards (*Buteo buteo*) from a Mediterranean area (Catalonia, NE Spain), by analyzing prey remains and pellets found in the nest, and stomach contents. The diet was seasonal. Relatively large items, such as young rabbits and Ocellated Lizards (*Lacerta lepida*), predominated in the breeding season, orthopterans and mantodeans in autumn and insects, rodents and soricidans in winter. Males presented an empty stomach more often than females, but only small differences were found in the diet of males and females.

RESUMEN.—Se analiza la variación estacional en la dieta del ratonero común (*Buteo buteo*) en una zona mediterránea (Cataluña, NE España) a base de restos de presas y egagrópilas encontrados en los nidos y al análisis de contenidos estomacales. La dieta varió estacionalmente. Durante el período reproductivo, el ratonero consumió presas relativamente grandes, tales como gazapos y lagartos, mientras que en otoño consumió preferentemente ortópteros y mántidos. En invierno los insectos, roedores y musarañas constituyeron la base de la dieta. Los machos presentaron el estómago vacío con mayor frecuencia que las hembras pero sólo se detectaron pequeñas diferencias en la dieta de ambos sexos.

The Common Buzzard (*Buteo buteo*) feeds on a wide range of prey, mainly rodents, but also on other vertebrates and invertebrates of appropriate size (Cramp and Simmons 1980). Its diet has been studied in most parts of its geographical range, and it reflects underlying differences in prey availability (Bustamante 1985). However, seasonal variation has received much less attention, probably because of difficulty in studying the diet outside the breeding season. In this paper we investigate the seasonal variation of the diet of the Common Buzzard in a Mediterranean area, where the species is present throughout the year.

STUDY AREA AND METHODS

Diet outside the breeding season was studied by analyzing the stomach contents of 69 Common Buzzards confiscated from hunters in the Mediterranean area of Catalonia (NE Spain) between October and February of 1982–87. The sex of 39 individuals was identified. Diet during the breeding season was studied in La Segarra county of Catalonia by collecting prey remains and pellets from 20 nests, during and after reproduction in 1985–89. Pellets were especially useful to identify small prey, which are rarely found as items in the nest (Mañosa 1991, Real 1991). The importance of each prey was expressed as the percentage of appearance of that prey among all prey items in nests, pellets or stomachs.

RESULTS AND DISCUSSION

Diet During the Breeding Season (Spring–Summer). European Rabbit (*Oryctolagus cuniculus*) was the most frequent prey species (Appendix 1). This has been found in other Mediterranean areas (Veiga 1982, Real 1987) but is unlike the deciduous forest region of Northern Spain where invertebrates form the bulk of the diet (Bustamante 1985). The Common Buzzard captured mainly young rabbits, very abundant in spring and summer (Soriguer 1981). The mean tarsus length of the rabbits taken was 37.5 mm (SD = 5.7, range = 26–64, $N = 122$), which corresponds to a mean weight of less than 550 g (Mañosa 1991). The second most consumed prey were reptiles, especially Ocellated Lizard (*Lacerta lepida*), also very common in spring and summer (Castilla 1989). Several species of birds formed an important percentage of the diet. Invertebrates, amphibians, rodents and shrews were taken only occasionally (Table 1).

Diet Outside the Breeding Season. Only 45 (65%) of the 69 stomachs analyzed contained at least one prey. A total of 240 prey items were found (Appendix 1). Insects were the most frequent prey both in autumn and winter (Table 1). Rabbits were

Table 1. Diet of Common Buzzard in Catalonia (NE Spain) expressed in percentages. Autumn includes October–November, winter December–February and spring and summer the breeding season.

	SPRING AND SUMMER		AUTUMN	WINTER	AUTUMN AND WINTER
	REMAINS	PELLETS			
Mammals	69.90	49.75	7.28	38.2	18.74
Shrews	0.33	0.00	0.00	15.73	5.83
Rabbits	66.55	21.89	0.66	2.25	1.25
Voles	0.00	6.47	3.31	6.74	4.58
Mice	1.34	5.47	1.32	10.11	4.58
Other mammals	1.67	15.92	1.99	3.37	2.50
Birds	16.50	12.44	0.00	3.37	1.25
Reptiles	13.88	35.82	3.31	3.37	3.33
Amphibians	0.17	0.00	0.66	7.87	3.33
Insects	0.00	1.99	87.42	43.82	71.26
Mantodeans	0.00	0.00	31.79	17.98	26.67
Orthopterans	0.00	1.49	54.97	19.10	41.67
Coleopterans	0.00	0.50	0.66	6.74	2.92
Other invertebrates	0.00	0.00	1.32	3.37	2.08
Total	598	201	152	88	240

taken only occasionally, and rodents and shrews were the most common mammalian prey. Because of the low temperatures, reptiles are not available during the autumn and winter periods (Castilla 1989), and their presence in the diet was restricted. In winter, most insect populations decrease, and small mammals (rodents and shrews) increase in their importance in the diet. Then they are especially abundant in open fields, where they lack cover as they feed. Amphibians increased their presence in the winter diet, when they concentrate around their breeding pools (Valverde 1967).

Seasonal and Sexual Comparison. Compared with pellet analysis, collections of prey remains in nests underestimates small preys (invertebrates, small mammals and reptiles). On grouping prey into invertebrates, poikilotherm vertebrates, birds, rabbits, and small mammals, differences were significant ($\chi^2 = 199.038$, $df = 4$, $P < 0.01$; Table 1). We analyzed seasonal variation by comparing pellet data with

stomach contents, eliminating by this way the bias associated with prey remain collections. On grouping prey into invertebrates, amphibians, reptiles, birds, rabbits and small mammals, we found differences between breeding-season, autumn and winter diets ($\chi^2 = 341.436$, $df = 10$, $P < 0.01$; Table 1). Buzzards consumed bigger prey during the breeding season than outside it, but it is possible that adults carried only large prey to the nests and consumed small prey themselves, as was observed in other raptors (Veiga 1982, Donázar 1988). This possibility should be taken into account when interpreting our results. The sex ratio of buzzards killed did not differ significantly from unity (20 males and 19 females; $\chi^2 = 0.026$, $P > 0.05$) with no variation between autumn and winter ($\chi^2 = 0.779$, $P > 0.05$). Data from

Table 2. Frequency of full compared to empty stomachs according to sex of Common Buzzards.

	MALES	FEMALES	TOTAL
Full	9	17	26
Empty	10	3	13
Total	19	20	39

Table 3. Number of Common Buzzard stomachs in which different prey were found in relation to sex.

	MALES (N = 9)	FEMALES (N = 17)
Invertebrates	5	8
Amphibians	3	0
Reptiles	1	2
Birds	1	1
Rabbits	0	2
Small mammals	8	10

both seasons could therefore be pooled to analyze differences in diet between the sexes. Empty stomachs were found more often in males than females ($\chi^2 = 6.278$, $P < 0.025$; Table 2). Although sample sizes were small, we found amphibians more often in stomachs of males than females (Fisher exact test $P = 0.03$) and Rabbits were taken only by females (Table 3). These differences may be related to the sexual dimorphism of the species (male weight = 828 g, female weight = 1052 g; Cramp and Simmons 1980) and can be explained either by prey selection or by habitat partitioning, as shown in Hen Harriers (*Circus cyaneus*; Newton 1979, Marquiss 1980), European Sparrowhawks (*Accipiter nisus*; Marquiss and Newton 1982, Newton 1986), or American Kestrels (*Falco sparverius*; Smallwood 1987, 1988).

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Appendix 1. Prey items of the Common Buzzard during the breeding and non-breeding season in Catalonia (NE Spain). Species with less than five representatives are grouped in the "other" category.

	BREEDING SEASON					
	REMAINS		PELLETS		FALL AND WINTER	
	N	%	N	%	N	%
Mammals	416	69.60	100	49.75	445	18.75
<i>Crocidura russula</i>	2	0.33			11	4.58
<i>Oryctolagus cuniculus</i>	398	66.55	44	21.89	3	1.25
<i>Sciurus vulgaris</i>	4	0.67	15	7.46		
<i>Microtus duodecimcostatus</i>			13	6.47	11	4.58
<i>Apodemus sylvaticus</i>	6	1.00	11	5.47	7	2.92
Other ^a mammals	6	1.00	2	1.99	7	2.92
Unidentified small mammals			15	7.46	6	2.50
Birds	96	16.05	25	12.44	3	1.25
<i>Alectoris rufa</i>	30	5.02			1	0.42
<i>Columba palumbus</i>	15	2.51				
<i>Garrulus glandarius</i>	11	1.84				
Unidentified Passeriformes	12	2.01	17	8.46		
Other ^a birds	12	2.01			2	0.83
Unidentified birds	16	2.67	8	3.98		
Reptiles	83	13.88	72	35.82	8	3.33
<i>Psammodromus algirus</i>	7	1.17	24	11.94		
<i>Lacerta lepida</i>	44	7.36	25	12.44		
Ophidians	31	5.18	8	3.98	1	0.42
Other ^a reptiles	1	0.17			7	2.92
Unidentified reptiles			15	7.46		
Amphibians	1	0.17			8	3.33
<i>Bufo</i> sp.					5	2.08
Other ^a amphibians	1	0.17			3	1.25
Arthropods			4	1.99	175	72.92
<i>Mantis religiosa</i>					64	26.67
<i>Grillotalpa grillotalpa</i>					13	5.42
Unidentified Acrididae					5	2.08
Other orthopterans			3	1.49	6	2.50
Coleopterans			1	0.50	7	2.92
Other ^a arthropods					4	1.67
Anelids					1	0.42
Oligochets					1	0.42
Total prey	598		201		240	

^a Other prey items include: Mammals: *Suncus etruscus*, *Eliomys quercinus*, *Rattus rattus*, *Mus spretus*, *Mus* sp., Unidentified Muridae, *Mustela nivalis*. Birds: *Columba oenas*, *Otus scops*, *Athene noctua*, Alaudidae, *Saxicola torquata*, *Turdus merula*, *Turdus viscivorus*, *Oriolus oriolus*, *Sturnus vulgaris*, *Fringilla coelebs*, *Emberiza cirrus*, *Miliaria calandra*, Nestling Passeriforme. Ophidians: *Malpolon monspessulanus*, *Elaphe scalaris*, Unidentified Ophidians. Reptiles: *Podarcis hispanica*, *Blanus cinereus*, *Natrix natrix*, *Natrix* sp., *Anguis fragilis*, *Vipera latastii*. Amphibians: *Bufo calamita*, *Hyla meridionalis*, *Rana perezi*. Coleopterans: Tenebrionidae, Carabidae, *Timarcha tenebricosa*, *Cetonia aurata*, *Geotrupes stercorarius*, Unidentified Coleopterans. Orthopterans: *Gryllus campestris*, *Oedipoda* sp., *Anacridium* sp., Unidentified Orthopterans. Arthropods: *Camponotus cruentatus*, Lepidoptera Larvae, *Disdera* sp., Unidentified Isopoda.